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ABSTRACT

The general aim of education is seen as creating possibilities for gaining experiences and acquiring knowledge, hence development of cognition. The knowledge ideal in education is understood within the frames of the historically produced scientific ideal, which also indicates the road by which knowledge may be obtained. This historical production may be characterized by a growing polarization in feminine/masculine, where the qualifications ascribed to the feminine ideal become devalued and repressed, whereas those ascribed to the masculine become ennobled as the road to knowledge. It is in the relation to this that the computer--the embodiment of the masculine ideal--as a tool in informatics is comprehended. It is argued that in order to ensure the development of knowledge, the feminine universe of interpretation is a necessary complementary approach. The point of departure for this shift is a greater emphasis on the uniquely human modes of cognition: the sensorimotor, the emotive, and the symbolic. Informatics--and education as a whole--should be founded in the relation between the two roads to knowledge. (29 references) (GL)

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"I TRUSTED THE MEASUREMENTS MORE THAN MY FOOT"

- said the man.

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The general aim of education is seen as creating possibilities for gaining experiences and acquiring knowledge, hence development of cognition.

The knowledge ideal in education is understood within the frames of the historically produced scientific ideal, which also indicates the road by which the knowledge may be obtained. This historical production may be characterized by a growing polarization in feminine/masculine, where the qualifications ascribed to the feminine ideal become devalued and repressed, whereas those ascribed to the masculine become ennobled as the road to knowledge.

It is in relation to this that the computer - the embodiment of the masculine ideal - as a tool in informatics is comprehended. It is argued that in order to ensure the development of knowledge, the feminine universe of interpretation is a necessary complementary approach. Point of departure for this is the human cognitive ways: the sensomotor, the emotive and the symbolic. In the relation between the two roads to knowledge, informatics - and education as a whole - should be founded.

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"I TRUSTED THE MEASUREMENTS MORE THAN MY FOOT"

- said the man.

"There was a man of Cheng, who was going to buy himself shoes. First he measured his foot; then he put the measurements away. When he got to the market, he discovered that he had left them behind. After he found the shoes he wanted, he went home to fetch the measurements; but the market place was closed when he returned, and he never got his shoes. Someone asked him: 'Why didn't you use your own foot?' 'I trusted the measurements more than my foot', he replied. (Han Fei Tzu in Roberts, Moss, 1979).

What does this little tale tell us about the man's consciousness of himself and his body? A man who does not dare rely on his subjective experience, but more on the objective measures. A man who does not trust the whole and qualitative experience of the shoe on the foot, but the reductionistic quantification. A man who places his well-being in the box of formal abstractions instead of in the hands of the sensuous, emotional experience; does the shoe fit or is it too big, does it pinch or close around the foot like a soft glove around the hand? The context has disappeared, and instead an abstract and formalized value system steps in its place, which finds its expression in the man's cognition of his self. He completely ignores it.

But how did it come about that the human beings repress the subjective, emotional and sensuous?

Yes, but it is a story from the world of folk tales, one may object. However, tales are also reflections of the real life, of norms and attitudes among people. As such they are products of historically and societally developed value systems, which penetrate human consciousness, societal organizations and institutions such as the educational system.

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The school is part of the educational system, and we send our children to school because this is the place where a fundamental part of children's education takes place. It is an education through which - we hope - the children will develop knowledge and qualifications, which will make it possible for them to survive in the world they are born into, and will participate in the development of.

A general aim of education may thus be described as creating the possibilities for gaining experiences and acquiring knowledge through which the children may acquire qualifications, develop cognition. But what kind of knowledge and hence which qualifications are considered essential for children to acquire, and how is the development of cognition ensured?

The content of education, that is the knowledge considered essential, is decided by the actual societal conditions, but also by historically developed knowledge traditions. As a general frame for the knowledge ideal in society, and hereby also for the school, stands the historically produced scientific ideal, which also indicates the road by which knowledge may be obtained. It is in relation to this that informatics in education must be comprehended. Which road to knowledge, which cognitive development does the computer, as a tool in informatics, lead to?

Changes in the knowledge ideal.

The conceptualization of the world enables us to move beyond the immediate and direct perception. Thus to name the world is an essential part of human activity, and in the naming we will also perceive the world in accordance with the concepts applied, and on the basis of the assumptions we build on. As

an example of the naming, and of the connotations embedded, the Witkin et al. experiment (1962) may serve. The aim of the experiment was to find out if there were sex differences in the perception of a stimulus. Subjects could either separate the stimulus from the surrounding field (the embedded figure), or they could perceive it as a whole - as part of the surrounding field. The general result was that women tended to see the stimulus as part of the wholeness, whereas men tended to see it separated from the wholeness. The behaviour of the men, which was taken as positive, was named: field independence. The behaviour of the women, taken as negative, was named: field dependence. Let us consider two other concepts for characterizing the behaviours: context aware (women) and context unaware (men). Clearly another connotation is conveyed, thus another perception.

Naming the world is especially the work of scientists, or rather:

"Naming nature is the special business of science ... In these acts of naming, the scientist simultaneously constructs and contains nature according to the relation and perspective" (Keller 1985) inherent in the scientific ideal.

The traditional knowledge ideal has long historical roots. Plato formulated an idealistic philosophy in which the real world was the world of ideas. Knowledge, or cognition, could be acquired through the liberation of the thought from the body, and the road to knowledge went through the renunciation of the sensuous lust. Aristotle, the founder of logic, considered philosophy the ultimate form of human mind, i.e. the world of concepts, but they grew out of the perceived reality, were founded in matter. The road to knowledge went through the active reason, which was characterized not by being libe-

rated from the body, but by exercising control with and curbing the forces of the sensuous body. But it is not until the seventeenth century scientific revolution that the philosophical ideals are reinforced radically. With Bacon's inductive method where the scientific ideal became experimental rather than theoretical, and where the goal became control with and mastery over nature, and with Descartes' soul/body division¹⁾, expressed in his famous credo: Cogito, ergo sum - the scientific ideals became founded in the societal universe of interpretations.

The scientific revolution must also be understood in relation to the societal changes. The establishing of the market oriented production and, along with this, the industrial revolution²⁾. Just as the essential role of political and economical forces in the development of science must be taken into consideration (Kuhn 1973). But for now, my interest is the concepts through which reality was grasped, that is, the trends in the naming of the world in science, as well as the question of the road to knowledge.

Originally, nature was perceived as feminine, as a nourishing giving mother in an organized universe, taking care of human beings. To meddle with nature would bring about disturbance in the existing balance in cosmos. This perception of the world as a coherent living system and of the earth as a caretaking mother disappears gradually, however, during the seventeenth century scientific revolution. With modern science

- 1) The body was conceptualized as a machine which transported the head around. The head was the essential part, because the soul was placed, more precisely, exactly in the center of the brain.
- 2) An example of the establishing of science as an autonomous discipline is the gradual SCIENTIFICATION of the work process (Taylor's Scientific Management).

Mother Earth became conceptualized as a mechanical object.

The transformation from an organic world view to a mechanical did not pass off untroubled and easy. The debate on the growing mining may serve as an illustration of this. The opponents of mining stressed that

"The Earth does not conceal and remove from our eyes those things which are useful and necessary to mankind SHE brings into the light of day the herbs, vegetables, grains, fruits and trees. The minerals on the other hand she buries far beneath in the depth of the ground, therefore they should not be sought". (Merchant 1983).

Whereas the defenders of mining argued that

"Nature has given the Earth to man that HE might cultivate IT, and draw out of ITs caverns metals and other mineral products". (ibid).

Thus mother Earth was neutralized, and became conceptualized as an object which could be made the subject of interventions³⁾.

This antagonism was, however, solved by establishing ceremonial rules for the behaviour of mineworkers. They had to undergo certain cleansing processes before entering the depths of the earth. But this ritual ceremony in which was embodied a certain care for nature - though it was merely of formal character - only counts in a transitional period. Gradually a more firm and cash way of handling nature makes progress. Nature becomes something which man may make himself the master of, something which man may subdue to his will.

"I am come in very truth, leading to you Nature with all her children, to bind her to your service and make her your slave", (and this would be done by) "conquer and subdue her". (Bacon in Keller 1985) - the new science had the power to do so.

The new scientific ideal was established on the basis of - and at the same time conditioned a change from - a holistic organic world view to a reduced mechanical world view

- 3) The conceptual change from SHE to IT, the neutralization, I will argue is not accidental, nor is the choice of the concepts HE-MAN - see later.

".... nature had been transformed in the mind of the mechanical philosophers from a semi-divine creative maternal figure to mere (very uninteresting) matter and motion". (Easlea 1981).

Man's mastery of Nature was the aim, and this could take place by creating

"a Masculine Philosophy whereby the Mind of Man may be ennobled with the knowledge of the solid Truth", according to Henry Oldenburg, secretary of the Royal Society (in Keller 1985).

The essential characteristics of Science became objectivity, logical rationality and quantification, expressed in its methodical approach

".... rational, experimental inquiry, unhindered by prejudice, wild speculation and emotional outbursts, was considered the only path to success". (Easlea 1981).

Nature was reduced in order to be subdued, controlled and mastered without consideration for the organic wholeness. Thus with the new scientific ideal the coherent, living, organic, feminine earth was neutralized, and reduced to a mechanical object, hence

"the mechanical philosophy banished life itself from the universe". (R.S. Westfall, in Easlea, 1981).

The Pure Reason.

As a parallel to the development of the mechanic world view, a gradual change in the view upon human beings also took place, and eventually came to rest in the scientific knowledge ideal. With the objective, rational, reductionistic and logical science in the high seat, the road to knowledge could not be reached through the subjective, the emotional and the sensuous dimensions in the human being. The rational thought - the pure reason - took over. The ideal human became a reason-driven, logical and objective cognizant being. The more spontaneous

emotional, sensuous and subjective human qualifications were sought repressed.

As mentioned earlier, this ideal does not belong solely to the seventeenth century scientific revolution. The banishment may be found as a red thread throughout the history.⁴⁾ But it is with the scientific revolution that the notion of pure reason as the driving force in the development of knowledge becomes the ideal.

Of course, the subjective, emotional and sensuous dimensions could not be repressed fully in man. Yet we find that the change led to a gender polarization in the human ideal. To be logical, rational and driven by pure reason were made the masculine ideal, and ascribed to the man. Whereas the subjective, emotional and sensuous dimensions came to make up the picture of the feminine ideal, and were ascribed to the woman. Though not as qualifications, on the contrary, to possess these dimensions was considered dequalifying. Women were viewed as intellectually inferior to men, because

"women's brains were less powerful than men's ... women were considered to be less rational than men, more emotional than men, more subject to passion" (Easlea 1981). 5)

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- 4) With Plato the road to knowledge had point of departure in the human interaction, in the homosexual relation between Erastes and Eromenos. But real knowledge could only be acquired by Erastes, and by freeing himself from the sensuous lustful body, transforming the drive to intellectual energy. A similar picture may be found in Freud's theory of sublimation.
 - 5) Again this polarization must be understood in a societal frame in the given period: The industrialization and the gender division on the labour market. However, as pointed out by anthropologists, the gender polarization in the human ideal with superiority placed in the men, not only has long historical roots in Western societies, but is also expressed cross culturally in other societies, from the aboriginals in New Guinea to the Yanomamö on the Brazilian-Venezuelan border. It is suggested that it is man's fear of women's nature which may be the source of this. (Easlea 1981).

The masculine ideal hence the qualifications deemed essential in the pursuit of science were ascribed only to men. But the feminine dimensions were considered embodied in both man and woman. For woman this was her destiny, and it was used to legitimize the restriction of her room for development, of her practical activities to husband, children and home. Just as it was used to legitimize her exclusion from "higher" knowledge in schools and institutions of learning such as universities.

"The females, through the cold and moist of their sex, cannot be endowed with so profound a judgement (as men); we find indeed that they take with appearance of knowledge in sleight and easy matters, but seldom reach any farther than to a sleight superficial smattering in any deep science". (ibid).

Man, however, could and should liberate himself from these destructive forces

"The Woman in us still prosecutes a deceit, like that begun in the Garden. And our Understandings are wedded to an Eve, as fatal as the Mother of our miseries". (Joseph Glanvill in Easlea 1981).

Man would be far from the Tree of Knowledge", unless all feminine characteristics were excluded from the true philosophy. Thus in the naming of the world, in the construction and understanding of reality and in the construction and understanding of the human being, a development has taken place which may be characterized by a growing polarization in masculine/feminine. In the dimensions ascribed to the feminine ideal, negative connotations are embedded, the ideal becomes devalued and to a growing degree repressed. Whereas the dimensions ascribed to the masculine ideal become ennobled as the ideal. With the scientific revolution the relation between man and nature may be characterized by a radical division between the knower and the knowable. The way to knowledge becomes masculine, only to be obtained by man, an autonomous, rational, logical cognizant

being, disconnected from nature. This is also true of nature, the sensuous emotional forces in man himself which must be subdued - thus man's connectedness with his self disappears. A consequence of this development⁶⁾ has been not only an exclusion of women from science, but also - as a tendency - an exclusion of the feminine universe of interpretation as an essential tool for describing, interpreting and conceptualizing the world. But more than that, it has meant repression of the emotional and sensuous qualifications. They are considered irrelevant for the development of science and for the road to knowledge - like with the man of Cheng. The consequence of this being that subjectivity has been denied and repressed too. It is objectivity which is produced.

Of course, subjectivity can never be fully repressed - though the neutralization in the naming of the world may lead one to believe so. Form and content in much scientific production is decisive. Research design, methods and results are presented within the frames of a formalized structure, in a complex self-referring language and in symbols (graphs and statistics as an example) in which it becomes difficult to find the picture behind the picture of reality which is being represented. Not to mention reality. The subject, the researcher himself has almost disappeared. Subjectivity, like mother Earth, has become invisible, they no longer appear in the naming.

Man made technology.

The computer is both the connecting link and the offshoot, or -----

6) To-days gender division on the labour market, as well as in the educational system, may be seen as the penetration of these ideals in the Societal Universe of Interpretation.

rather the result of the merging of technology and science.

In a sense, the computer is a child of mathematic. Constructed on the basis of the mathematical logic, the pure logic, and it can only process information within these frames. Information which is to be stored and processed in a computer must be systematized and structured according to the rules and principles of the formal logic. No ambiguity, if the computer is to function, the concepts must not be diffuse, as they cannot be made the object of interpretations. Thus information must be reduced to data. This reduction also hold true for the language which is used. No matter how much it is attempted to make programming language natural, it is still an artificial language. It may be characterized as unambiguous, static and independent of context. Whereas natural language is characterized by its ambiguity, its relation to the concrete world, and its dependence of context thus being dynamic. (Nielsen & Roepstorff, 1985).

Of course, in principle all information may be stored in a computer. But it is not all information which can be processed, at least not immediately. A picture can be transmitted, that is copied. The same applies to symbols, e.g. letters, words etc. But none of them can be processed unless they are allotted a meaning.

The computer can only process that which may be represented unambiguously, in a digitalized form. Obviously, not much in the world or in nature is unambiguous or digital, but one may reduce reality.

Once reality has been reduced, the processing in the computer can only take place according to the rules and principles of the data logic,

"Programming demands unambiguity, formalization, hierarchial organization and temporal structuring". (Nielsen 1986).

This is even true of user "friendly" programming languages such as LOGO.

"Learning to program means learning to deal with the rigour and formalism which is essential in programming, learning to deal with decontextualized symbols and knowledge decomposing the problem to elements, hypothetically planning steps ahead, following the temporal logic, and writing the program as sequential instructions". (ibid).

Reality, that of which we may know something has been reduced to data. And the road to knowledge and cognition has to pass through the computer, the wedge between the world and the human. The computer becomes the means through which knowledge of reality may be required, thus the knowable and the knower, subject and object become radically separated.

As such, the computer may be viewed as the temporarily extremity in a scientific and technological development, which has taken place within the frames of a mechanical world view, and a reductionistic view upon the human being.

The computer - one may say - is a mechanical "being" which logically, rationally and objectively deals with a reduced reality. The computer is - by some people - considered intelligence itself. Though an artificial intelligence - but, and this is essential, liberated from the muddiness of emotions, senses and subjectivity. With the computer - then - the masculine ideal has been reached.

Computers in education.

The point of departure, and the foundation for building up knowledge, becomes that which has been explicitly verbalized and reduced to data. The road to knowledge is defined a priori.

the computer demands that the data be systematized hierarchically and structured according to the necessary temporal logic. These two dimensions constitute the advantage of the computer. The ideal is to ignore the peculiarity of any specific domain, and doing this, most processes can be simulated by the computer, by working from uniquely-defined concepts, and the formalized analysis of the process. The main point is to focus on the structure, to organize the data into a sequential procedure. This is the power of the computer, and has been taken as point of departure for naming it: a transitional object. (Papert 1980). A universal tool to the extent that it is assumed that working with the computer

"challenges higher mental functions, and ensures a cognitive development which is of general value: a procedural thinking" (Nielsen 1986), or logical thinking.

Thus must research leaves one with the general impression that children do not encounter many problems when working with computers. On the contrary, the implication is that the learning process is of osmotic character,

"like learning French by living in France without being taught". (Papert 1980).

This appears to be the case whether children learn to program in LOGO (Papert et al 1979)(Papert 1980), or they work with text processing (Lawler 1980, 1985). The structure is gradually absorbed by the child and becomes the structure in accordance with which other knowledge areas may be organized. It is the rigour, formalism and decontextualized symbols (when programming) which ensures the development of higher cognitive skills, of logical thinking. (Noss 1983a, 1983b, 1985).

One may object that the curriculum in Informatics is much more than programming. This is certainly true for Informatics in

Denmark. Besides learning about the computer, learning to use it as a problem solving tool, children also have to learn about the consequences of computers for society as a whole. (Datalære 1985). However, experiences show that it was difficult for teachers to present the content of the subject in coherence, and

"Neither teachers nor pupils felt that there existed a red thread from microchips to the information society". (Ferdinand 1986).

Besides, learning problem-solving with the computer was such a time-consuming and difficult process for children, that often only very little time was left for the other topics. Teachers tended to stress programming even more strongly when they found that the children did not understand the programming language, and in the explanations often ventured into detailed teaching (ibid).

Thus the results of the data processing hardly ever become topics for discussion and evaluation in the classroom. An evaluation where children draw on other methods, other models and knowledge. But this would also demand a profound understanding of the model in accordance with which the processing of data takes place. It is a CATCH 22, the mastering of programming and knowledge of how the computer work is a must, just as children must acquire understanding and knowledge of other models, of other ways of acquiring knowledge of the world. This in turn implies that the teacher must ensure fundamental domain specific knowledge (the peculiarity of). Given that, the pupils may become cognizant of the consequences of applying different models and using different methods of approach - but to get so far, they must master the computer and so on.

However, whether or not the children acquire the mastering of the computer and programming, the message conveyed to them is clear, the method for treating information and reducing the world to data - is the goal. Thus the masculine ideal is reinforced, and children learn that the emotional, sensuous and subjective approaches to the world are of little value.

Computers and cognition.

Much research has, however, questioned the notion of the osmotic learning process, and the cognitive gain. Whether children draw on databases, use text processing systems or learn to program, acquiring the ability to handle the computer, to understand how it works and how to use it, does not come about as a "fingertip effect". (Perkins 1985). Programming is, as pointed out by Pea and Kurland (1983a, 1983b), a very complex activity, which demands qualifications at a metacognitive level, not a small task for children (nor for adults).

Research (Nielsen & Roepstorff 1985)(Nielsen 1986) has shown that only very few children (14-15 years old) acquire mastery of programming. Most children have problems in understanding the programming language, the uniquely-defined concepts, some of which remained meaningless. For some of the children, the text picture on the screen often seemed incomprehensible, just as they had problems in understanding the relation between graphic and text. Subroutines were, for most of the youngsters, a hurdle, and for some of them remained unmanageable, even after 40 hours of programming, just like working with the systematic temporal structure. The mastering of the sequential procedure was only acquired with difficulty, and many children never learned it. The children's thought processes simply moved along other tracks, and structuring thoughts into a

priori defined pattern in order for mastery to be acquired did not come about easily. As one of the boys said when the computer failed - at the 11th attempt - to produce a triangle on the basis of a program where REPEAT had to be used (he had 7 REPEATs in his program), "This is a very unpredictable machine". The research showed that intensive and extended human interaction was necessary if children were to move beyond the mere copying and mechanical use of textbook samples.

Children approach the world, or topics in education, in ways very different from "the cognitive computer", or rather, data logic only exists in computers. One may come to master the procedural approach as a method, but

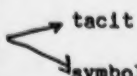
"to acquire this method is not to be comprehended as possessing procedural thinking it is not a psychological category, but belongs to the world of computer science" (Nielsen 1986).

In the acquisition of knowledge, human beings draw on both the qualifications, which historically have come to be named masculine, respectively feminine, that is in the senso-motor, the emotive and the symbolic cognitive ways. These being the basis for human cognition, for a person's comprehension of a coherent world throughout life.⁷⁾

The senso-motor way of cognition has body and senses as basis, and is qualified through the individual's practical activity, by laying hands on reality. The emotive cognitive way grows out of and is qualified through human interaction, on the basis of the necessary emotional relations formed with other

7) For a detailed presentation and discussion of this cognitive models see: Nielsen & Roepstorff (1985): Girls and computers, worlds apart? Contributions to GASAT III, 64-80. (Kingston, England), and Nielsen, Janni (1986): Not the computer, but human interaction is the basis for cognition and education, Education and Computing.

humans. Emotions function as the orienting means for a person's way of relating to the world, and through which is created the possibility for dissolution of borders between self and others, for caring identification. The symbolic cognitive way may be understood as the ability to let the world be represented by words alone⁸⁾, to allot a meaning to the symbol. Language is founded in human interaction, and in the mother/child interaction (the ideal model) language moved from being merely sounds to the child, to become the naming of the interaction. Through the use of language in many different situations, the sounds are differentiated, they are allotted a meaning, and gradually become concepts. But not uniquely-defined, as opposed to computer language, because there are no sharp borders in everyday life, but blurred, and the concept derives its meaning from the context in which the emotive and senso-motor dimensions are embedded.

process of concept formation  tacit
symbolic (Nielsen 1983)

The tacit dimension, or tacit knowledge (Polanyi 1968) is understood as the senso-motor and emotive cognitive ways. Obviously part of this knowledge may become verbalized, but it is essential that we bear in mind that: We know much more than we can say. In our cognition of reality, we draw on tacit knowledge, part of which is indeterminable (ibid), thus on much more than that which has been explicitly verbalized.

Language is a means of communication, but it may become detached from human interaction, from direct experiences. Through language one may transgress the immediate, voice the past, create theoretical constructions etc. As such, language becomes -----

8) It may be transformed through music, colours, images etc., but here I shall deal only with language.

an essential - but not the only - tool for cognition. Scientific concepts are examples of an abstract language, a result of mental processes. But in order for these results not to become merely figments on the brain, they must have reality as point of departure, and they must, in turn, be confronted with reality, with context.

However, language may become detached from context, to the extent that it becomes a pure abstraction. No body, no senses nor human relations hold it. When nothing embodies language, it is without reference and must be defined, and rules and principles for the use of it must be made. It becomes signs, like mathematic and computer language, though they may be very useful tools - given that they are applied in a qualitative way.

The complementary approaches.

Niels Bohr (1957) has pointed to the necessity of complementary descriptions, stated in relation to an epistemological problem within the frames of quantum physics. Though other knowledge domains differ from quantum mechanics, complementary descriptions are also necessary in these areas. Thus information of the world acquired through the application of computers must be qualified by applying other approaches as well.

In the knowledge ideal in science, in society and in education is embedded the repression of that which historically has been named feminine: the subjective, emotional and sensuous. The computer will reinforce this tendency, but with a qualitative difference. The computer introduces an as-if-world, not the palpable reality, and the knowledge gained through laying hands on reality does not come into play. Children have to work with signs, not symbols deriving their meaning from con-

text, and thought processes must be forced into a priori given patterns. One may fear that the computer will have direct access to the symbolic side in the process of concept formation, but a formation which will not be carried through, because the tacit dimension is left out. Thus one may speak of impoverished cognition; information may be gathered, but knowledge will not be acquired.

If informatics are limited mainly to programming, education will also result in a polarization: the few who really do master the computer and the many who do not. A division which simultaneously shows itself as a gender polarization (the historical roots stretching into the future): It is boys - some boys - who get hooked on the computer, not the girls. Internationally this has been expressed as a concern for girls (and women) in relation to the future labour market, and special initiatives have been carried through. However, the aim seems to be to get girls to accept and internalize the masculine ideal, and repress and curb "the woman inside as fatal as Eve in the Garden". 9)

But it is the masculine ideal embedded in science and technology - two forces in our society, upon which a continually more controlling role has been conferred - which is fatal. Along with its undeniable success, it also carries with it the means of destruction. It has brought forward, and still produces nuclear weapons in a continuous arms race, despite the fact that we have enough to destroy the world several times over. Pollution of seas, lakes and the atmosphere, smog - and acid rain killing forests. An ideal which has also been the basis

9) There are many boys too, who have not rid themselves "of this Mother of our miseries".

for the development of an industry and of work processes where the sensuous, emotional and living human being is reduced to a mechanical object, performing only the most necessary hand-, eye- and finger movements. Meanwhile 15 million people - most of them children - die of hunger every year. 500 millions are undernourished, and almost 40 % of the world population do not have access to the most fundamental medical help (Capra 1982).

If informatics is to be a discipline, or computers a tool in education, it is essential - in order for knowledge to be acquired hence cognition developed, and in order for the polarization to be counteracted - that other ways of acquiring knowledge of the world be given room. The basis for this is to take human cognitive ways as point of departure. Thank Eve, many children have problems in learning to work with computers, and most children do not get hooked on the machine at all, but show resistance. A resistance which education must draw on. Children's subjective, emotive and sensuous approaches to the world, these other roads to knowledge should be the foundation for, and should be qualified through education (the computer takes care of the masculine approach). Thus the necessary complementary approach to the masculine approach is the feminine universe of interpretation, which must be legitimized as an essential tool for describing, interpreting and dealing with the world. In the relation between these two, informatics - and education as a whole - should be founded. Through this, life which has been banished from the universe, and nature in man himself which has been repressed, may come alive.

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